

The Canadian Entomologist

VOL. LVI.

ORILLIA, MARCH, 1924.

No. 3.

NOTES ON THE EARLY STAGES OF GRASSHOPPERS*

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The immature stages of grasshoppers have not been studied with the thoroughness that might be expected considering the importance of many of the species. Riley¹, it is true, gave a fairly comprehensive account of *Melanoplus spretus* and made comparisons with a few other species, but since then, with the exception of a recent paper by E. Eleanor Carothers², very little has been done to increase our knowledge of the subject.

During the autumns of 1921 and 1922 a number of grasshopper egg masses were collected near Treesbank, Manitoba and brought to Ottawa for study. These eggs were kept outside in freezing temperature until January, when they were placed in a warm situation for hatching and the resulting nymphs reared to maturity.

The following methods were employed in breeding the insects:

The cages consisted of two-quart fruit jars with cheesecloth coverings in which were placed blotting paper to soak up surplus moisture and some moss or fine shavings for the hoppers to rest in. The cages were placed near a steam radiator for warmth and they were kept in the sun as much as possible. Heat is an essential factor in rearing grasshoppers though it is necessary to guard against too much by providing shelter from excess of sunlight on hot days.

A little care is necessary in feeding to begin with, particularly with certain genera such as *Camnula*. The *Melanopli*, however, are satisfied with almost any form of vegetation. I have found Wandering Jew (*Tradescantia*) to be particularly suitable for the younger nymphs owing to its habit of keeping fresh for several days without water. For species that do not eat this plant readily, grain grown in pots may be used.

Judging from the species observed, it would seem that a close similarity exists in the development of most of the *Oedipodinae* and *Locustinae*; all having probably five moults and the characteristics of the various stages appearing to be fairly consistent. On the whole, however, the *Oedipodinae* are more variable than the *Locustinae* and characters apparently stable in the latter differ considerably in the former. One point in particular characterizes the two families. In the *Oedipodinae* there is, as a rule, a marked difference in coloration of the first instar over the succeeding ones, the markings frequently providing a color pattern that is strikingly different from allied genera and probably species. The *Locustinae*, on the other hand, are alike in color throughout their life and the differences between species are much less marked.

The following is a summary of the characters separating the immature

*—Contribution from Division of Field Crop and Garden Insects, Entomological Branch, Department of Agriculture, Ottawa.

1.—Entomological Commission on the Rocky Mountain Locust, U. S. Geological Survey, 1877.

2.—Notes on the Taxonomy, Development and Life History of certain Acrididae. *Trans. Am. Ent. Soc.*, Vol. XLIX, 1923.

stages of species of the Genus *Melanoplus* as reared by me. It also applies to many of the *Oedipodinae* but in others it is less clear, possibly due to a fusion of certain antennal joints or their failure to separate.

First stage. Antennae 13-jointed, meso and metanotum together almost as long as pronotum.

Second stage. Antennae 17-jointed, pronotum longer than meso and metanotum combined.

Third stage. Antennae 20-jointed (occasionally 22); mesonotum hidden by pronotum; wing pads prominent extending downwards.

Fourth stage. Antennae 22-jointed, meso and metasternum entirely covered by pronotum; wing pads horizontal or upturned.

Fifth stage. Antennae 24-jointed, wing pads extending to more than a third of the abdominal length.

Sixth stage. External development complete, the insect having become an adult.

There is some variation in the number of antennal joints in the latter stages and it is wise to use these characters with caution. The position and size of the wing pads will assist to place the stages accurately in all cases of doubt.

It will be noted that there are some differences in these conclusions from those arrived at by Riley. I have also been unable to verify his statement in which he says that "the first three larval skins are cast on or near the ground." In our cages the nymphs invariably mounted on some herbage and fixed themselves head downwards before working out of the old skin. The skin, however, was soon dislodged from its support and under natural conditions it would soon blow into a little hollow in company with others, thus providing the clusters of cast skins so frequently met with during grasshopper outbreaks.

The following account taken from my notes gives an outline of casting the skin apparently applicable to all species:

The insect first attaches itself firmly, usually selecting a shady situation and a support that enables it to hang free. The head is invariably downwards. There are a few minutes of semi-activity during which the hopper attempts to obtain a firmer hold with its hind legs; then the antennae drop over the head and vigorous contortions of the muscles are noted along the dorsal line of the thorax. Almost imperceptibly and unnoticeably, the skin splits behind the head and soon after the head is freed. The contortions continue now farther back, with intervals of rest, until eventually the insect is hanging by the extremity of its abdomen. At the critical moment, when a fall seems inevitable, the nymph swings towards the support, grasping which it pulls itself free from the skin and now, facing upwards, proceeds to undergo the process of hardening necessary before it can join its companions in the pleasure of feeding or basking in the sunshine.

In the account given above the insect was an example of *Melanoplus bivittatus*, one of the easiest of all to rear. The process of skin casting in this case took twenty-three minutes, which is about the average time occupied in the task. There is usually a further period of about three hours, during the process of hardening, before the hopper is ready to feed.

Useful characters for separating the species are often present in the egg, both through the pattern and color. Size, too, is useful, though, as Riley pointed

out, the eggs swell with the development of the embryo within and this alters their general appearance.

The following notes may help to identify the species reared by me.

Camnula pellucida Scud. *Eggs*, pale cream colored tinted with reddish brown, the darker color often in the form of streaks or irregular stripes; surface deeply pitted.

Nymph. In its first stage this is easily recognized by the striking color pattern on a dark background, namely a white band extending across the front below and behind the eyes, a white collar covering most of the metazona and extending narrowly towards the head above, and a white space at the base of the hind femora. The insect is spotted and marked with white and various darker shades which differ in the individuals.

After moulting the nymph loses its striking coloration but retains the general dark background. The most prominent features are a wide black space behind eyes extending irregularly down the face; a large shiny black area enclosing a small elongate white mark on the side of the pronotum and a series of dark lateral marks down the abdomen. There is very little difference of color in succeeding instars nor can the antennae be definitely relied upon after the second instar owing to an apparent fusion of some of the joints. On this account the antennae are still apparently 17-jointed in the third instar, 18 in the fourth and 20 in the fifth; the terminal joint, however, is very long and may really constitute more than one. The wing pads are brownish with radiating dark lines and a white elongate patch near base.

The individuals from which the above description was taken took thirty days to reach maturity.

Mestobregma kiowa Thom. *Eggs*, dark reddish orange with one or more pale yellow streaks, reticulation fine.

Nymph. The 13-jointed antennae is grooved above on the basal joints, first joint black at base, 2 to 8 pale with 8 black-rimmed, the remaining joints black. Head black and white, spotted; body dark grayish, lateral half of pronotum pale. The mottled gray, black and stone white of this insect make a detailed description impossible in a short paper. A striking feature of this first instar is the brick-red hind tibiae bordered on the anterior third by black. The nymph closely resembles the adult after the second moult, the color pattern being extremely variable. The antennae cannot be relied upon with certainty for identifying the various instars.

This species took 37 days to mature in our cages.

Spharagemon collare Scud. *Eggs*, pale cream, reticulation large, distinct.

Nymph. Head and body yellowish, suffused above with black and white spots, a series of wide wedge-shaped spots down dorsal area of abdomen, also a row of pale lateral spots and in some examples a large whitish mark on metanotum and metazona, the latter ultimately constituting the collar characteristic of the species. Hind femora with the basal quarter pale, almost without spots, the rest shiny black with two small spots indicating bands; hind tibiae black with a pale ring on basal quarter. After moulting the insect loses its striking color pattern and becomes similar to the adults in vestiture, there being much individual variation. The antennal characters are difficult to discern but apparently conform

to the general number. Two female examples in this rearing underwent a sixth moult. The development of the insect took 35 to 40 days.

Melanoplus confusus Scud. Eggs, pale cream colored, reticulation fine in the form of indistinct slightly elongate meshes.

Nymphs. Gray with darker markings, indistinctly barred legs and the usual curved whitish line running obliquely behind the eyes over the pronotum. There is little variation in color in the various instars. The species after the second moult shows an ash-gray body with light brown on sides of pronotum and the whitish line as before bordered above with blackish. The wing pads are black and the hind femora have two dull oblique bands. Examples in our cages took 40 days to reach maturity.

Melanoplus angustipennis Dodge. Eggs, dark cream color, reticulation well marked.

Nymph. Dull grayish white suffused with pale brown and spotted on upper surface with rather closely placed irregularly sized round black marks; legs mottled, hind femora with two blackish bands only visible on upper and inner face.

The insect becomes darker after moulting. There is a black semi-rounded mark near the base of the metathorax slightly more than its own width from the lower extremity of same. There is also a dark line behind eyes.

The wing pads may be dark or light in color. They have a whitish spot near their base. The hind tibiae are bluish in the last nymphal stage but become red in the adult.

These individuals reached maturity in from 32 to 36 days.

Melanoplus packardi Scud. Eggs, bright yellow, reticulation distinct.

Nymph. Very similar to *angustipennis* for which it was mistaken. It seems to be separable by the lack of dark bars on the outer face of hind femora and a dark suffusion on the upper outer edge but there is so much individual variation in color that mistakes may easily occur. The insect is considerably larger than *angustipennis*.

Specimens reared in 1922 took 58 days to mature, while one reared in 1923 took 38 days.

Melanoplus atlantis Riley. Nymphs very dark as a rule but variable in color, a typical example in fifth instar showed the following markings: Head brownish, indistinctly streaked and spotted, prozona black, metazona brown; a lunate streak on sides of prozona; abdomen blackish above, yellowish beneath; wing pads black with a white basal spot; hind femora brownish orange black barred; tibiae dull blue. There is the usual dark mark behind eyes.

Specimens took from 35 to 46 days to develop.

Melanoplus luridus Dodge. A third stage nymph showed the following typical markings: Head pale brown ashy behind, face white suffused in centre with grayish pink; eyes blackish with a wedge-shaped shiny black area behind them narrowing posteriorly; pronotum dull white above marked with various sized spots of blackish and bordered by a black mark extending from behind the eyes to about half the pronotal length; sides white to pinkish enclosing a semi-lunate black mark arched upwards; abdomen above ashy-white much suffused with black, the darker color forming a pale dorsal line of the white above it, as well as pale rings to the segments—underside bright yellow; wing pads dark; hind

femora yellowish white with a black area on the upper part of the outer face covering two-thirds of surface and narrowing anteriorly.

The black streak on hind femora at once separates this species from any other described in this paper. It has a resemblance to the black stripe of *bivittatus* but it is wider at centre and less uniform in outline. The insect is also more ashy-gray than any others reared by me.

✓ *Melanoplus bivittatus* Say. Eggs dark orange, very shining, reticulation indistinct or lacking. Number from 40 to 108 in a sac.

Nymph. . First instar. Dull pinkish brown with irregular small spots of black and brown, a pale yellowish line on sides of pronotum and a black dash behind it on metanotum; hind femora with a wide blackish stripe running to a point at base and widening to cover the entire outer face at anterior extremity.

Second instar. Color creamy, paler beneath. Suffused with sooty spots above, dorsal line paler; thorax with a wide lateral stripe bordered above by a wide area of black and less heavily below by the same color; a black band behind eyes; hind femora with a distinct black stripe.

Third instar. Markings generally more distinct, otherwise as previous stage; wing pads present, down-turned.

Fourth instar. Color as before; wing pads up-turned, black bordered above by a lighter shade.

Fifth instar. No change in color, markings more distinct; wing pads extending to nearly half the length of abdomen.

Sixth instar. Insect fully developed externally.

The distinguishing features of this species are the lateral stripes of the pronotum and the straight black stripe of the hind femora. The body color may vary from yellowish to green.

The following summary gives the main features of the life history as shown in our cages:—

| | | | |
|--------------|------------|---------------------|-------------|
| Eggs hatched | January 27 | Fourth moult | February 13 |
| First moult | February 1 | Fifth moult | February 20 |
| Second moult | February 5 | Copulation occurred | March 5 |
| Third moult | February 8 | Eggs deposited | March 16. |

Total period from hatching of eggs to adult 24 days, to egg laying 47 days.

Owing to the impossibility of keeping these insects while traveling they were killed on March 22. The female was found to contain 64 eggs, almost ready for depositing, but there was no indication of a further clutch of eggs in her ovaries. The male showed no appreciable sign of age.

Melanoplus bivittatus has a very wide range in North America, yet it varies but little in either size or in habits. There are some differences in color, however, doubtless due to geographical variations in humidity. The most noticeable of these differences is the color of the hind tibiae, which are red in the more humid regions, and yellowish or bluish in the drier ones.

In order to test the influence of moisture on the dry land race a number of nymphs from Manitoba were subjected to unusual humid conditions, the result being that seven became red legged adults and six were of the normal color.

NEW SPECIES OF NORTH AMERICAN CAPNIIDAE (PLECOPTERA)

BY P. W. CLAASSEN,

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(Continued from page 48.)

Capnia teresa sp. nov.

Length to tip of wings, ♂, 6.5 mm. Expanse, ♂, 11 mm.

General color brown. Head brown, wider than prothorax; lateral tubercles polished; occiput marked with longitudinal ridges; hind ocelli closer to eyes than to each other; antennae brown, composed of about 26 segments. Prothorax a little wider than long, somewhat widened behind; front angles broadly rounded, hind angles narrowly rounded; sides somewhat convex; surface moderately rugose, the rugosities coarse and few in number. Legs brown. Wings subhyaline; Sc reaches to the cord; R of forewing sinuate at origin of Rs. Abdomen brown; cerci brown, composed of about 19 segments.

Genitalia: Male. Seventh abdominal tergite with a raised, rearward pointing chitinous knob, closely beset with fine spines and deeply emarginate behind; ninth tergite partly cleft and each side of the middle with a raised granulate knob; supraanal process recurved, enlarged into a somewhat spherical bulb which bears a short pointed process at the tip; subanal lobes upcurved and ending in a spine-like process; ninth sternite slightly produced and broadly rounded behind.

Female unknown.

Holotype: male, October 15, 1922, Evey Canon, Claremont, Theresa Robinson. Cornell University Collection.

This species is rather closely related to *C. tumida* but is smaller, lighter in color and differs in the structure of the genitalia.

Capnia manitoba sp. nov.

Length to tip of wings, ♂, 5.5-5.5 mm.; ♀, 7.5-8.5 mm. Expanse, ♂, 8.5-9 mm.; ♀, 13-14 mm.

General color very dark brown to blackish. Head black, wider than prothorax; covered with fine pile; lateral tubercles large, flat, shiny; hind ocelli closer to eyes than to each other; antennae blackish, composed of about 35-38 segments. Prothorax black, wider than long, the sides convex; angles rounded; surface rather rugose. Legs dark brown, the femora darker above. Wings fumose, veins dark brown. Abdomen blackish. Cerci dark brown, with about 18-20 segments.

Genitalia: Male. Seventh abdominal tergite with a V-shaped incision on the anterior margin and on the posterior half with a large, raised, rounded, finely granulate knob which is slightly emarginate behind; supraanal process recurved over the tergum, the upper part greatly arched, rod-like, gradually tapering to a point and reaching to the knob on the seventh tergite (natural position). The lower part of the supraanal process is more slender and lies closely appressed to the tergum, reaching to the tip of the upper part; subanal lobes ending in short, upcurved, spine-like processes; tenth tergite medially bifid; ninth sternite slightly produced into an evenly rounded subgenital plate.

Female. Eighth abdominal sternite not produced into a definite subgenital plate.

Holotype, male; *allotype*, female; April 28, 1907, Aweme, Man., N. Criddle. Canadian National Collection.

Paratypes: 6 males and 5 females from same locality.

Capnia glabra sp. nov.

Length to tip of wings, ♂, 4 mm. Expanse, ♂, 6 mm.

Length, to tip of abdomen, ♂, 5.5 mm.

General color brown. Head a little wider than prothorax; dark brown covered with fine pile; hind ocelli about three times as close to eyes as to each other. Antennae brown, composed of about 33 segments. Prothorax brown; wider than long; front and hind angles broadly rounded; sides somewhat convex; surface slightly rugose. Legs brown. Wings subhyaline; considerably shorter than abdomen in the male; Sc reaches nearly to the cord; R sinuate at origin of Rs. Abdomen brown. Cerci or tails long, composed of about 25 segments, the middle segment about four times as long as wide; end segments about five times as long as wide.

Genitalia: *Male*. Eighth and ninth abdominal tergites somewhat depressed in the middle; ninth tergite each side with a slightly raised hairy knob; tenth tergite bifid; supraanal process recurved, slender, bluntly pointed and reaching to the middle of the eighth tergite; subanal lobes triangular, upcurved and ending in short, sharp spines; ninth sternite slightly produced and evenly rounded.

Holotype: male, Dec. 25-26, 1922, Sunnyside Mine, Plumas Co., Calif., H. S. Barber. In the National Museum, Washington, D.C.

Paratypes: males from the same locality, Dec. 25 to Jan. 24.

Capnia barberi sp. nov.

Length to tip of wings, male, 5 mm. Expanse, about 8 mm.

General color dark brown. Head wider than prothorax, dark brown; occiput slightly rugose; hind ocelli about twice as close to eyes as to each other; antennae dark brown with about 31 segments; palpi brown. Prothorax brown, wider than long; front angles broadly rounded, hind angles more narrowly rounded; widened posteriorly; sides somewhat convex; surface moderately rugose. Legs brown. Wings uniformly subhyaline; veins dark brown; in forewing Rs branches from radius at a very broad angle. (The wings in this specimen are in rather poor condition, not being fully expanded.) Antennae brown; cerci brown (one absent, the other with only 12 segments present).

Genitalia: *Male*. Seventh abdominal tergite with a narrow, sharp chitinized tubercle; supraanal process recurved, composed of three parts, a lower excavated sheath which extends to the tubercle, and two pointed processes above, about two-thirds as long as the sheath; subanal lobes short, triangular; ninth sternite slightly produced into an evenly rounded subgenital plate, which bears a short tubercle behind; ninth tergite partly divided; tenth tergite bifid.

Female unknown.

Holotype: male, Jan. 24, 1923, on snow, Feather River Canon, near Caribou, Plumas Co., Cal. (Sunnyside Mine to near Belden), H. S. Barber. Collection of U. S. National Museum.

Capnia brevicauda sp. nov.

Length to tip of wings, female 6-6.5 mm. Expanse 10-10.5 mm.

General color dark brown. Head wider than prothorax; dark brown; fron-

tal ridge black; large, black, flat, polished lateral tubercles; a large rounded black spot back of each hind ocellus; hind ocelli only about two diameters distant from the eyes. Prothorax about as long as wide; sides nearly straight; front angles broadly rounded, hind angles quite sharp; surface slightly rugose; three narrow median longitudinal black lines and a narrow black line completely surrounding the inner disc. Legs dark brown. Wings uniformly fumose; crossvein beyond Sc about half way between the cord and tip of wing; R not sinuate at origin of Rs. Cerci short, composed of 4 or 5 segments.

Genitalia: Male unknown.

Female. Eighth sternite unmodified and not produced into a subgenital plate.

Holotype: female, Boulder, Colorado, G. S. Dodds. Cornell University Collection.

Paratypes: four females from the same locality.

***Capnia fibula* sp. nov.**

Length to tip of wing, male, 7 ? mm.; female, 9 mm. Expanse, male, 12 ? mm.; female, 16 mm.

General color dark brown. Head wider than prothorax; lateral tubercles large, dark, flat, polished; occiput somewhat rugose; hind ocelli about twice as close to eyes as to each other. Antennae of male gone, in female composed of 33 segments. Prothorax wider than long; sides about straight; front angles broadly rounded; hind angles quite sharp; surface very slightly rugose. Legs brown; wings lightly infuscated; crossvein beyond subcosta originates at the cord; R sinuate at the origin of Rs. Tails long, composed of 13 or more segments.

Genitalia: *Male.* Seventh tergite bearing on the median posterior margin a rounded button, closely beset with small papillae; supraanal process recurved, short, truncate, the tip slightly emarginate; ninth sternite slightly produced and rounded behind, subanal lobes ending in short, upcurved, spine-like processes.

Female. Eighth sternite not produced into a subgenital plate, but with the hind margin somewhat uneven.

Holotype, male; *allotype*, female; Las Vegas Hot Springs, New Mexico, 7,000 feet, Jan. 22, 1902, T.D.A. Cockerell. Cornell University Collection.

***Capnia elongata* sp. nov.**

Length to tip of wings, male 7 mm. Expanse, male 12.5 mm.

General color dark brown. Head a little wider than prothorax, brown; occiput marked with longitudinal dark lines; hind ocelli almost twice as close to eyes as to each other. Antennae dark brown.

Prothorax wider than long, dark brown; somewhat widened behind; front angles broadly rounded, hind angles narrowly rounded; surface moderately rugose in the middle portion. Legs dark brown. Wings subhyaline; Sc ends before the cord; R sinuate at origin of Rs. Cerci brown, composed of at least 21 segments.

Genitalia: *Male.* Seventh abdominal tergite with a raised, black, granulate, rounded transverse knob on the hind margin; eighth and ninth tergites with a slight median depression; tenth tergite bifid; supraanal process recurved, slender, very long, reaching to the knob on the seventh tergite; subanal lobes upcurved

and ending in short, spine-like processes; ninth sternite slightly produced and evenly rounded.

Female unknown.

Holotype: male, Jan. 24, 1922, near Caribou, Plumas Co., Calif., H. S. Barber, in the National Museum, Washington, D.C.

Paratypes: four males from the same locality.

Capnia californica sp. nov.

Length to tip of wings, male, 6.5 mm. Expanse, male, 11 mm.

General color brown. Head wider than prothorax; lateral tubercles large, polished; occiput with longitudinal rugosities; hind ocelli at least three times as close to eyes as to each other; antennae dark brown, darker toward the tip. Prothorax a little wider than long; a little widened behind; angles rounded; surface somewhat rugose, the rugosities mainly in the form of three longitudinal darker irregular lines. Legs brown. Wings subhyaline; R of forewing only slightly sinuate at the origin of Rs. Abdomen brown; cerci brown, composed of about 20 segments.

Genitalia: *Male.* Hind margin of eighth abdominal tergite deeply emarginate so that there is only a narrow chitinized "collar" in the center, leaving the main portion membranous; ninth tergite with two round, raised, chitinous knobs which are granular and beset with long hairs, the area between the knobs largely membranous; tenth tergite bifid; supraanal process recurved, short, enlarged, excavated above and bearing on the ventral side near the tip a tooth; subanal lobes triangular, ending in short, spine-like processes; ninth sternite slightly produced and evenly rounded.

Female unknown.

Holotype: male, IV-14-18, Cazadero, California, E. P. Van Duzee, in the California Academy of Sciences.

Capnia gracilaria sp. nov.

Length to tip of wings, male, 5 mm. Expanse, male, 8.5 mm.

General color blackish. Head a little wider than prothorax, black; nearly smooth; ocelli very small, the hind ocelli about twice as close to eyes as to each other; antennae blackish. Prothorax wider than long; slightly widened behind; angles rounded; surface slightly rugose in the median region. Legs blackish brown. Wings subhyaline; R of forewing sinuate at the origin of Rs; Sc ends before the cord; stem of Rs-M in hind wing about one-sixth the length of Rs before the cord. Cerci composed of about 16 segments (tip probably broken off).

Genitalia: *Male.* Abdominal tergites without any knobs or processes except the seventh, which has a very slight indication of a small median knob; eighth and ninth tergites with a slight median depression; tenth tergite bifid; supraanal process recurved, slender and very long, normally reaching to the seventh tergite; subanal lobes broadly triangular and terminating in short, spine-like processes; ninth sternite slightly produced and evenly rounded.

Female unknown.

This species is very closely related to *A. grandis* Bks. but is only about one-third as large.

Holotype: male, April 28, 1907, Aweme, Man., N. Criddle. Cornell University Collection.

**SOME NEW SPECIES OF ERYTHRONEURA (HOMOPTERA,
CICADELLIDAE)**

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Some of the species described here were taken from their hibernating quarters, among layers of dried leaves, this winter in Kansas and last winter in Ontario, Canada. Winter collecting is a good supplement to summer sweeping and sometimes brings to light forms rarely seen during the summer.

The genus now contains forty-one species, of which thirteen together with their numerous varieties, are known to feed upon the grape. An examination of the inner genitalia of the following forms has shown marked differences from those of species previously described.

***Erythroneura rosa* new species**

Vertex dull red with two yellow spots on anterior margin and three on posterior. Pronotum slaty to maroon, three pallid spots on anterior margin, the two outer ones being longer than the inner; discal area slaty. Scutellum light yellow with basal angles brown and tip red. Tegmina whitish hyaline with the following color pattern: whole of clavus pale rose except a white area at the inner basal angle adjoining tip of scutellum and one in posterior third but not involving the tip; in the middle of clavus the color may be darker red. This coloration extends across corium to the yellow costal plaque in a broad band about as wide as long from which a narrow oblique streak extends back to cells M_4 and M_2 . Base of apical cells smoky; a dark spot in apex of costal plaque.

Holotype: male, Atherton, Mo., May 19, 1922, C. F. Adams.

Allotype: female, Douglas Co., Kansas, December, 1923, W. Robinson.

Types deposited in the Museum of the University of Kansas.

***Erythroneura kanza* new species**

Vertex and pronotum smoky grey to fulvous with two light red vittae making an inverted "V". Scutellum red with a brown spot in each basal angle and a white median vitta. Tegmina smoky hyaline throughout, almost dusky, two dull maroon vittae each paralleling the claval suture, one on the clavus and the other on the corium; apical cells smoky; crossveins white.

Holotype: male, Douglas Co., Kansas, P. B. Lawson.

Allotype: female, Douglas Co., Kansas, P. B. Lawson.

Paratypes: males and females, Douglas Co., Kansas, P. B. Lawson; Douglas Co., Kansas, December, 1923, W. Robinson.

Types deposited in the Museum of the University of Kansas.

***Erythroneura gradata* new species**

Vertex and pronotum yellow with sometimes an elongate red vitta on each side of a pale median line. Scutellum yellow with paler median vitta. Tegmina, ground color white hyaline, basal half of clavus red except a mark resembling an inverted comma at inner basal angle; an irregular orange-red area on corium extending from humerus half the length of claval suture; apical third of clavus and the veins up to the whitish crossveins light orange-yellow; a smoky area extending from the tip of cell R_5 to the base of cells M_2 and M_4 ; costal plaque yellow to white with posterior oblique dark line.

Holotype: male, Douglas Co., Kansas, P. B. Lawson.

Allotype: female, Douglas Co., Kansas, P. B. Lawson.

Paratypes: males and females, Douglas Co., Kansas, P. B. Lawson.

Types deposited in the Museum of the University of Kansas.

Erythroneura lawsoni new species

Vertex, pronotum and scutellum pale yellow with the following white markings: two spots on posterior margin of vertex close to the eyes, a median vitta on disk; a large spot on middle of anterior margin of pronotum and a lighter one on each side, posterior margin whitish; scutellum, a median vitta sometimes not reaching the tip. Tegmina, ground color creamy white with orange markings as follows: on clavus a small spot near base, an almost square area in basal third, and a small spot near tip; on corium an oblique vitta in front of costal plaque, an irregular area between the latter and the clavus; some irregular streaks in front of the red cross veins. A small black dot in the apex of costal plaque and a conspicuous black spot in base of cell M_4 .

Holotype: male, Ithaca, New York, July, 1921; P. B. Lawson.

Allotype: female, Ithaca, New York, July, 1921, P. B. Lawson.

Paratypes: males and females, Ithaca, New York, July, 1921, P. B. Lawson.

Types deposited in the Museum of the University of Kansas.

Erythroneura campora new species

Vertex red with five white spots which tend to be arranged as follows: two on anterior margin, two on posterior, and one central. Ground color of pronotum, scutellum and tegmina creamy white with the following red marks: on pronotum a "Y" shaped median vitta with heavy base, a spot on each side; scutellum, three triangular spots, one in each angle; tegmina, in basal half of clavus an oblique vitta which is enlarged caudally to face the tegminal suture, near tip a spot, a spot on corium near humeral angle, a more or less continuous semi-circular vitta bordering the inner margins of the costal plaque and extending to the base of cell M_4 . Crossveins and parts of adjacent longitudinal veins red. A black spot in apex of costal plaque and another in base of cell M_4 .

Holotype: male, Douglas Co., Kansas, October, 1923, W. Robinson.

Allotype: female, Douglas Co., Kansas, October, 1923, W. Robinson.

Paratypes: males and females, Pottawatomie Co., Kansas, F. F. Crevecoeur; female, Kansas City, Mo., April 1, 1901, F. Rogers.

Types deposited in the Museum of the University of Kansas.

Erythroneura trivittata new species

Vertex creamy yellow with very pale red marks outlining three yellow spots on posterior margin. Pronotum yellow on anterior and greyish on posterior margins with a small red spot on the latter behind each eye. Scutellum deep blood red. Tegmina, maroon band across base; in the apical third of clavus but not involving the tip a small red band which is continued on to the corium, where it broadens abruptly to about twice the width and the color deepens to a dark maroon; an almost square blue area in the region of the costal plaque carries the band across to the costal margin; cross veins and parts of adjacent longitudinal veins red; a smoky area extending from the base of cell M_4 to the apex of cells R_s and R_i .

Holotype: male, Kansas City, Mo., December 1, 1901, F. Rogers.

Allotype: female, Kansas City, Mo., December 30, 1901, F. Rogers.

Types deposited in the Museum of the University of Kansas.

Erythroneura hymac new species

Vertex, two ivory spots on anterior margin and three on posterior, the middle spot faintly encircled with red. Pronotum ivory, faint red "Y" shaped median vitta and a red triangular spot behind each eye. Scutellum, a small red spot in each basal angle and with orange or red tip. Tegmina sub-hyaline with eight faint orange spots arranged almost equidistantly as follows: three on clavus and five on corium; a small black spot behind the region of costal plaque and one in base of cell M_4 ; cross veins more or less reddish.

Holotype: male, Douglas Co., Kansas, April 20, 1922, P. B. Lawson.

Paratype: male, Douglas Co., Kansas, April 20, 1922, P. B. Lawson.

Types deposited in the Museum of the University of Kansas.

Erythroneura rubranotum new species

Vertex ivory with apex and two small spots on base faintly red. Pronotum and basal half of scutellum deep maroon; tip of scutellum white. Tegmina, ground color light yellow, red band across base, a wide red band with darker margins occupying apical half, excepting tip, of clavus and extending over corium to an elongate brown area in the region of costal plaque; cross veins red, apical cells smoky.

Holotype: male, Pottawatomie Co., Kansas, F. F. Crevecoeur.

Allotype: female, Pottawatomie Co., Kansas, F. F. Crevecoeur.

Types deposited in the Museum of the University of Kansas.

Erythroneura corni new species

Vertex brownish-red with two transverse rows of four white spots each, the middle spots connected to form longitudinal vittae; posterior half often of lighter color. Pronotum, anterior margin yellow, a large brown discal area, a lateral red spot behind each eye; two smoky-grey spots on posterior margin. Scutellum brown with faint median and transverse line yellow. Tegmina hyaline with the following pattern in red: on clavus, a vitta in touch with claval suture from the base about one-half the length of the latter, and a spot covering apical third; on corium, a vitta extending from near base of wing to costal plaque, thence inwardly half way around the latter where it becomes enlarged and almost touches claval suture, then narrows again and continues to the posterior end of the costal plaque, where it forms a "Y" with heavy base, one arm extending to the tip of clavus and the other along cubitus to the red cross veins. Apical cells smoky except middle of cells R_3 and M_4 . An oblique dark line in apex of costal plaque. The blackish abdomen shows through the tegmina and gives the insect a dark appearance.

Holotype, male, Douglas Co., Kansas, October, 1923, W. Robinson.

Allotype: female, Douglas Co., Kansas, October, 1923, W. Robinson.

Paratypes: males and females, Douglas Co., Kansas, October, 1923, W. Robinson.

Types deposited in the Museum of the University of Kansas.

Erythroneura ontari new species

Vertex yellow, chief red markings being a median and two lateral thin streaks. Ground color of pronotum, scutellum and tegmina greyish-white faintly marked with red as follows: pronotum with heavy "Y" shaped median vitta and a streak on each side behind the eyes; scutellum with a spot in basal angles and

at tip. Tegmina marked as follows: a broad vitta on clavus in touch with basal half of claval suture and barbed at caudal end, and a spot in apical third; corium with a broad stripe with five lateral extensions running the entire length of cubitus, the three inner ones extending toward the claval suture at its base, middle and tip respectively, and the two outer ones touching the anterior and posterior parts respectively of the costal plaque; red streaks between costal plaque and red cross veins; base and tips of cells smoky.

Holotype: male, Vineland, Ontario, Canada, January, 1923, W. Robinson.

Allotype: female, Vineland, Ontario, Canada, January, 1923, W. Robinson.

Paratypes: males and females, Vineland, Ontario, Canada, January, 1923, W. Robinson.

Types deposited in the Museum of the University of Kansas.

Erythroneura acuticephala new species

General ground color yellowish-white with light red markings as follows: vertex, a long, very slender inverted "U" shaped vitta; pronotum, a slender "Y" shaped vitta with short arms and long heavy base, a long vitta on each lateral margin; scutellum, a large spot entirely red or outlined in red in basal angles, a spot at tip. Tegmina, on clavus a vitta beginning half way between humeral and inner basal angles and proceeding half the length of the claval suture, where it becomes enlarged and projects inward and touches the tegminal suture; on corium an oblique vitta beginning about half way between humeral angle and costal plaque and proceeding inward to a point one-third along the claval vitta, an oblique vitta beginning as a narrow streak in front of the costal plaque, soon widening and proceeding back to the base of cell M_4 and being connected with the tip of the claval vitta by a short band. Crossveins red; apical cells smoky; an oblique dark mark in the apex of costal plaque; a black dot in the apex of R_s and the base of M_4 . The marks on the tegmina tend to be lighter colored with darker margins. This is a slender species with very pointed vertex.

Holotype: male, Douglas Co., Kansas, December, 1923, W. Robinson.

Allotype—♀, data similar but June 25, 1919.

Paratypes: females, Douglas Co., Kansas, December, 1923, W. Robinson; Pottawatomie Co., Kansas, F. F. Crevecoeur.

Types deposited in the Museum of the University of Kansas.

Erythroneura beameri new species

General ground color creamy white with the following red markings: vertex, two posteriorly diverging vittae making an inverted "V" shaped mark; pronotum, a broad "Y" shaped vitta with arms and base of about equal width and length, a vitta on each lateral margin; scutellum, a solid spot or outline of one in each basal angle and a spot at the tip; tegmina, on clavus a vitta in touch with basal half of claval suture with a caudal barb which projects forward and inward to meet the tegminal suture, tip of clavus red; on corium an oblique line arising near the humeral angle and meeting the middle of the claval vitta, another which borders front and inner margins of the costal plaque and then proceeds to the base of cell M_4 . Cross veins red; cells smoky. An oblique dark mark in the apex of costal plaque; a black dot in the apex of cell R_s and base of cell M_4 .

Holotype: male, Douglas Co., Kansas, November, 1923, R. H. Beamer.

Allotype: female, Douglas Co., Kansas, November, 1923, R. H. Beamer.

Paratypes: males and females, Douglas Co., Kansas, November, 1923, R. H. Beamer and W. Robinson.

Types deposited in the Museum of the University of Kansas.

Erythroneura omaska new species

Vertex orange with a median vitta and four lateral spots of yellow. Pronotum white, a "Y" shaped median vitta with yellow arms and orange base, a diamond shaped orange vitta behind each eye. Scutellum creamy with yellow spots outlined in red in each basal angle and red tip. Tegmina, ground color opaque white with the following orange markings: on clavus a vitta in touch with basal half of claval suture, constricted in the middle and barbed at caudal end and a spot at tip; on corium an oblique streak near the base, a line bordering front and inner margins of costal plaque in the middle of which is an abrupt extension to the claval suture, then a line proceeding in a widening paler vitta to the base of cell H_4 . Crossveins vermillion; apical cells white bordering crossveins and remainder smoky. An oblique dark streak in the apex of costal plaque, and a black spot in the apex of cell R_s and base of cell M_4 .

Holotype: male, Douglas Co., Kansas, October, 1923, W. Robinson.

Type deposited in the Museum of the University of Kansas.

Erythroneura lacta new species

Vertex, pronotum and scutellum creamy white. Tegmina opaque white relieved by the following color pattern: vertex, two very pale yellow spots on posterior margin; pronotum, an indistinct yellow "Y" shaped vitta; scutellum, a light yellow spot in each basal angle and at tip. Tegmina, on clavus an orange spot at base, a red triangular area at middle and an orange spot at tip; on corium an orange spot at base, costal plaque bordered on front and inner margins by a narrow orange mark at the middle of which is a short red extension to meet the claval suture and at its caudal end a faint orange vitta which proceeds in a widening line to base of cell M_4 . Cross veins more or less reddish; a black spot in the apex of cell R_s and base of cell M_4 .

Holotype: male, Vineland, Ontario, Canada, August, 1922, W. Robinson.

Allotype: female, Vineland, Ontario, Canada, August, 1922, W. Robinson.

Types deposited in the Museum of the University of Kansas.

Erythroneura vitis flava new variety

Vertex, pronotum and scutellum buff, a brownish area on disk of pronotum. Tegmina, ground color canary yellow, light brown band across base, a broader reddish-brown band across middle. Cross veins faintly red; apical cells smoky.

Holotype: female, Owatonna, Minn., June 22, 1921, A. A. Nichol.

Type deposited in the Museum of the University of Kansas.

RHAGOLETIS SYMPHORICARPI, A NEW TRYPANEID FROM BRITISH COLUMBIA (DIPT.)*

BY C. HOWARD CURRAN,

Ottawa, Ont.

The species described below has been known for several years but has been considered conspecific with *R. pomonella* Walsh. I have prepared a paper

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

which will be published elsewhere dealing with the occurrence of *R. symphoricarpi* and therefore omit a detailed account. The species described below does not attack apple, but confines itself to the berries of *Symphoricarpus racemosus* (the Snowberry). In general the three species which have been included under *R. pomonella* agree in most respects. They may be separated as follows:

Rhagoletis pomonella Walsh.

Genital claspers from side view rather strongly curved upwards, their upper apical margin decidedly cut off, the lower edge rather straight. (This position is reversed from the natural as it is assumed that the claspers are projecting apicad for descriptive purposes). From a more ventral view the median finger-like projections are long, strongly curved and the flange is rather rectangular basally. The spot on the scutellum usually occupies the apical half and extends on the disc, well beyond the apical bristles; size usually over 4 mm.

♀. The white scutellar spot occupies two-thirds or more of the length of the scutellum and is very prominent to the naked eye. Size usually over 4.5 mm.

Rhagoletis symphoricarpi n. sp.

Genital claspers from side view only slightly curved, the portion beyond the arms laterally compressed, the finger-like projections shorter, less strongly curved; the flange very oblique basally, the apex of the clasper almost straight on the upper margin, and more cut off below so that the point is dorsal, not inferior. The spot on the scutellum is much smaller and usually does not extend very much laterad of the apical bristles; size seldom over 3.5 mm., usually slightly less.

♀. The white scutellar spot seldom occupies more than the apical half of the scutellum and is usually very distinctly narrower than in *pomonella*; length 3.5 to 5 mm., the average length slightly over 4 mm.

Holotype—♂, Victoria, B.C., June 30, 1919 (W. Downes) reared from *Symphoricarpus*; No. 634 in the Canadian National Collection, Ottawa.

Allotype—♀ data similar but June 25, 1919.

Paratypes—Victoria, B.C., 4 ♂, 1 ♀, June 20, 1919; 4 ♂, 4 ♀, June 25, 1919 (Downes), all reared; ♂, June 15, 1919, ♀ June 16, 1919; 2 ♂, June 18, 1919; 2 ♂, 2 ♀, June 24, 1919 (Downes); Lytton, B.C., 1 ♀, 5 ♀, reared from *Symphoricarpus*, (Downes) Saanich District, B.C., August 8, 1918, (Downes).

R. zephyria Snow.

Female. The scutellar spot occupies less than the apical half of the scutellum and reaches well laterad of the apical bristles. The paler laterad margins of the front at the middle extend as far inside the frontal bristles as the distance from the base of the bristles to the orbit. In both the preceding species the pale stripe scarcely extends inside the base of the bristles and these are also slightly closer to the orbit.

The description of *R. pomonella* is from specimens bred from apple in Ontario and Quebec, that of *zephyria* is from a co-type loaned by Prof. S. J. Hunter of the University of Kansas.

DESCRIPTIONS OF NEW REARED HYMENOPTERA FROM
NOVA SCOTIA AND BRITISH COLUMBIA*

BY H. L. VIERECK,

Ottawa, Ont.

***Ephialtes cacoeciae* n. sp.**

Strictly following Cushman's Key to North American Ephialtini, 1920, this would go to *Apechthis*, from which it differs chiefly in that it goes to (*Pimpla*)—*Ephialtes*, in Foerster's Key. In Cushman's Key to *Ephialtes* this species goes, on the initial characters in the dichotomy, to *E. acqualis* Prov., from which it differs in the emarginate eyes. Ignoring the initial character in the dichotomy above referred to this would be an *Itoplectis* near *montana* Cushman from which it differs further as follows:—

Female. Length 7.5 mm.; antennae about 5 mm.; exserted portion of ovipositor 1.7 mm.; head virtually as wide as the thorax, face striate down the middle and with adjoining or nearly adjoining punctures and together with mandibles and malar space clothed with thin virtually colorless hairs, clypeus at base apparently impunctate, its anterior two-thirds mostly deeply impressed, the impression shiny, finely indefinitely sculptured, impunctate, malar space half as long as basal width of mandibles, frons finely sculptured, apparently impunctate, occiput and cheeks indistinctly punctured, polished, ocelli well separated; pronotum polished except along the margins, mesonotum not as closely punctured as the face, prescutum apparently extending over the hind margin of the pronotum; mesosternum apparently punctured like the mesonotum, mesopleura more sparsely punctured than the mesonotum, metapleura polished, indistinctly punctured and nearly bare, fore-tibiae virtually as long as their femora, outside length of hind femur: its greatest width on the outside::37:12; abdomen with nearly level tergites, the apical impression not well developed, the lateral elevations on the second tergite wanting and poorly developed on the succeeding tergites, width of third tergite at apex: its length: 30:19; length of exserted portion of sheath: length of abdomen: 40:100.

Black, legs mostly reddish, apical edge of tergites 2 to 4 narrowly pale brownish, tegulae brownish at apex, antennae blackish to brownish, palpi brownish, wings brownish, stigma and veins mostly much darker brownish than the membrane, stigma pale stramineous at base and apex, fore and mid-tibiae with an incomplete whitish annulus, fore-tibiae with a dark brownish stain, mid-tibiae with a blackish basal annulus that is continuous with a blackish stain that interrupts the whitish annulus.

Male. Length 6.5 mm.; differs from the female chiefly as follows,—palpi whitish, fore and mid-coxae mostly whitish, hind coxae partly reddish, malar space relatively a little longer, fore and mid-legs pale.

Holotype—♀, Vernon, B.C., July 20, 1923. No. 5170, C, host *Cacoecia argyrosoma*. (E. P. Venables) No. 702, in the Canadian National Collection.

Allotype—♂, same locality and host, July 17, 1923 (D. G. Gillespie).

Paratype—♂, ♀, same locality and host, July 22, 1923 (E. P. Venables); and host *C. rosana* L., July 10, 14, 15, 1922; (W. Downes).

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Ephialtes (Itoplectis) montana Cushman

Proc. U. S. Nat. Mus., LVIII, 346, 1920.

Since in the original this species is described by comparison with 346, 1920. Since in the original this species is described by comparison with *E. obesus* Cushman, I have compiled the following description of *E. montana* Cushman in order to facilitate the determination of *E. cacoeciae*.

Very stout, thorax nearly as high as long; head much narrower than thorax and set very close to the very short vertical pronotum, face rounded, with well separated punctures and together with mandibles and malar space, clothed with long dense cinereous pubescence, clypeus at base sparsely punctured, in the middle deeply impressed, the impression polished, at apex rounded truncate and with a single row of punctures, malar space nearly half as long as basal width of mandible, antennae inserted far above middle of eyes, the latter deeply emarginate opposite antennae, frons, occiput and cheeks sparsely, weakly punctured, polished, ocelli large and close to each other, postocellar line longer than diameter of lateral ocellus which is less than twice as long as the ocell-ocular line; pronotum polished, mesoscutum as wide as long, sparsely, weakly punctured, with very short, fine, whitish pubescence, and with practically no trace of notauli, prescutum medially extending slightly farther cephalad than upper margin of pronotum, mesopleura and mesosternum even more weakly so, punctiform fovea very deep, metapleura polished, almost without sculpture or vestiture; propodeum convex in profile, laterally with dense puncturation and vestiture, medially and posteriorly polished and without vestiture, dorsal carinae strong only at base but extending obsoletely nearly to middle, spiracles rather small, nearly round, legs very stout, front tibiae much shorter than their femora, front claws toothed at base, hind femora less than three times as long as deep; abdomen narrow, finely very densely punctured and clothed with very short white pubescence, first tergite about as wide as long, its dorsal carinae extending beyond middle, anterior basin but little more than half total length of tergite, other tergites, especially second and third, with apical impression and lateral elevations well developed, terminal tergites subpolished and weakly punctate, third tergite nearly two-thirds as long as wide, ovipositor short, stout, less than one-third as long as abdomen, sheath with very short, dense black pubescence.

Black, with legs largely red, apices of tergites 2-4 very narrowly dark piceous, humeral spot, wing bases and tegulae white, the latter brown at apex, antennae brown, all palpi pale, wings hyaline, veins and stigma blackish, the latter pale at apex and base, front coxae black except at apex, hind femora black at apex, hind tibiae black with a white annulus in about the second fourth, their tarsi black, the first three joints white at base, fore and middle tibiae and tarsi with same color pattern but less distinct, the black being replaced by ferruginous on the mid-legs and by stramineous on the fore-legs, except that the basal annulus of the middle tibia is black.

Gambrus venablesi n. sp.

Superficially this agrees best with *Gambrus* ? *shorberi* D. T. from the original description, of which it differs however sufficiently to warrant its treatment as a distinct species.

Female. Length 8 mm.; exserted portion of the sheaths of the ovipositor 2.5 mm.; more or less reddish throughout except for yellowish maculae and the

color of the eyes and apex of mandibles which are blackish, in length the joint one of the flagel: joint 2 :: 17 : 13, clypeus swollen anteriorly, head and thorax finely sculptured, not tangibly punctured, inner eye margin between the occiput and the antennal line with a yellowish band that widens toward the lateral ocelli, sixth to ninth joints of the flagel inclusive, whitish above; notauli apparently distinct to the middle of the dorsulum, upper edge of propleura with a whitish mark, tegulae stramineous with a yellowish dot posteriorly, at least the posterior third of the scutel and the elevated median portion of the metanotum luteous or yellowish with a brownish tinge, propodeum with only the transverse carinae present, the hind carina wanting in the middle third of the posterior aspect of the propodeum.

Holotype—♀, Vernon, B.C., July 20, 1923. (E. P. Venables). No. 711, in the Canadian National Collection, Ottawa.

Phaeogenes cacoeciae n. sp.

Presumably related to *Phaeogenes hebrus* Cresson.

Female. Length 7 mm.; head black, shiny, with distinct adjoining or nearly adjoining punctures, except on the clypeus, which is virtually polished and has smaller, widely separated punctures, clypeus not separated from the face, length of malar space : width of mandibles at base :: 5 : 6, scape blackish, pedicel and first to fourth joints inclusive of the flagel brownish, rest of flagel blackish except the 9th-12th joints inclusive, which are mostly whitish, mandibles mostly black, palpi blackish; thorax sculptured much like the head, notauli barely suggested, sternauli distinct and extending backward and upward nearly half way toward the posterior margin of the mesopleura, tegulae black, wing base partly yellowish, wings with a brownish tinge, stigma blackish, veins not so dark, coxae and proximal trochanters mostly blackish, distal trochanters and rest of legs mostly reddish-brown, hind femora blackish, except at base and apex, their tibiae blackish at apex, process of hind coxae truncate; areola separated from the petiolarea by the difference in sculpture, the former appearing granular, the latter transversely striate, areola as long as its greatest width although appearing longer than wider, the costulae joining its sides a little below the middle; abdomen shining, finely sculptured and with close shallow punctures, first tergite blackish excepting the margins, second, third and base of fourth tergites reddish, rest of tergites blackish except the apical edge of the seventh and eighth which are yellowish, postpetiole nearly sculptureless except for a subapical row of punctures, gastrocoeli smooth, subbasal and nearly half as wide as the second tergite is wide at base, lunulae distinct and nearly circular on the second tergite, indistinct on the third.

Male. Length 9 mm.; sufficiently like the female to be readily associated therewith; antennae blackish except for the scape and flagel which are brownish beneath, malar space shorter, hind femora reddish throughout, hind coxae simple.

Holotype—♀, Vernon, B.C., July 10, 1923, host *Cacoecia argyrosipa* pupa, No. 5170 B, (E. P. Venables), No. 712, in the Canadian National Collection, Ottawa.

Allotype—♂, July 17, 1923, No. 570 A, otherwise with the same data as holotype.

Paratypes—♀, July 16, 17, 20, 22, 23, 1923, no number, otherwise with

the same data as the holotype. July 18, 1923; (D. G. Gillespie), no number, otherwise with the same data as the holotype and three with the same data as the holotype throughout. ♂. No number, July 20-22, 1923; July 20, 1923, No. 570 A, otherwise with the same data as the holotype; July 12, 17, 1923 and July 17, 1923, 570 A, (D. G. Gillespie) other data as in holotype.

Campoplex (Angitia) basizona n. sp.

A typical *Angitia* in venation. Presumably related to *Angitia plutellae* Viereck.

Male. Length 4.5 mm.; black, antennae black throughout, 31-jointed, joints 1 and 2 of the flagel subequal, mandibles yellowish except for the reddish teeth, palpi whitish; thorax finely sculptured, tubercles black, tegulae and wing bases whitish, areolet complete, petiolate, its petiole apparently as long as the long sides of the areolet, recurrent vein virtually interstitial with the second transverse cubitus, fore-legs stramineous except for the whitish coxae and trochanters and the almost whitish outer side of the tibiae, mid-legs colored much like the fore-legs except that the mid-coxae are dark at base, hind coxae and proximal trochanter black, distal trochanter nearly whitish beneath, fuscous above, hind tibiae whitish except for the basal and apical fourths which are blackish, spurs whitish, hind tarsi brownish, infuscated above, all claws blackish; propodeum rather coarsely sculptured, basal area acutely triangular, areola and petiolarea confluent and of the type found in *Hyposoter parorgyiae* Viereck; costulae rudimentary, area dentipara well separated from the confluent areola and petiolarea, the confluent area interna and area angularis well defined and more coarsely sculptured than the petiolarea; abdomen black except for the membranous portion of the first sternite and the second tergite, which are more or less yellowish and fuscous, obliquely truncate at apex, cocoon uniformly pale.

Holotype—♂, Vernon, British Columbia, July 18, 1922 (M. Downes); host *Cacoecia rosana* Linn.; No. 738 in the Canadian National Collection, Ottawa.

Campoplex (Angitia) cacoeciae n. sp.

Venation of *Amelotconus*. Has characters in common with *Angitia macer* Cresson and *Angitia plutellae* Viereck.

Female. Length 6 mm.; black, head finely sculptured, antennae black, throughout, 33-jointed, joint 1 of the flagel a little longer than joint 2, mandibles yellowish except for the blackish base and apex, palpi dull stramineous; thorax finely sculptured, tubercles black, tegulae and wing bases whitish, areolet complete, petiolate, petiole virtually as long as the shortest side of the areolet, recurrent vein received by the areolet a little beyond the middle, fore-legs, including their coxae, reddish, mid-legs concolorous with the fore-legs except that their coxae are blackish with a reddish apex, hind legs mostly reddish, their coxae and trochanters black except that the distal trochanter is reddish beneath, hind tibiae blackish at apex, their tarsi reddish beneath and blackish above except for the metatarsi, which are mostly reddish but blackish above at the apex, spurs staminous; propodeum finely sculptured, the basal area poorly defined, quadrangular, areola and petiolarea confluent, shallowly concave, the incomplete costulae poorly developed, the area dentipara confluent with the areola and petiolarea and the area spiracularis, area interna and area angularis confluent, well defined and coarsely sculptured; abdomen black except for the membranous portion of the

first sternite and the second sternite which have yellowish and fuscous bands, exposed portion of the sheaths apparently as long as the oblique truncature of the abdomen.

Holotype—♀, Vernon, B. C., July 5, 1923 (K. F. Auden), host *Cacoecia rosana* Linn.; No. 737 in the Canadian National Collection, Ottawa.

Paratype—♀, No. 10573, with the same data as the holotype. This specimen has complete though poorly developed costulae. *See notes of 127*

Campoplex (Angitia) rosanae n. sp.

With the venation of *Amelocotonus*. Has characters in common with *Angitia pterophorae* Ashm. and *Hypothereutes acronyctae* Ashm.

Female. Length, 5 mm.; black, head finely sculptured, antennae black throughout, thirty-jointed, joint 1 of the flagel distinctly longer than joint 2; mandibles pale yellowish except at the apical end, where they are dark, palpi whitish. Thorax finely sculptured, tubercles black, tegulae and wing bases whitish, areolet complete, petiolate, petiole nearly as short as the shortest side of the areolet, recurrent vein almost interstitial with the second transverse cubitus or the outer side of the areolet, fore coxae mostly whitish, trochanters of fore and mid-legs whitish, fore and mid-tarsi pale brownish, hind tibiae with the basal sixth blackish, the next three sixths whitish, the apical third blackish, hind tarsi blackish except for a yellowish annulus at extreme base of metatarsus, elsewhere the legs are reddish except for a yellowish suffusion of the outer surface of the fore and mid-tibiae, spurs whitish; propodeum finely sculptured, the basal area triangular, petiolate, areola and petiolarea confluent, of the type found in *Hyposoter parorgyiae* Vier.; costulae virtually wanting, the fine sculpture of the area externa contrasting with the coarse sculpture of the area dentipara; abdomen black or blackish, except for the yellowish second sternite, exposed portion of the sheaths apparently as long as the oblique truncature of the abdomen.

Holotype—♀, Sydney, N.S., August 3, (S. J. Harrington), host *Cacoecia rosana* Linn.; No. 736 in the Canadian National Collection, Ottawa.

Macrocentrus nigridorsis n. sp.

First, second and most of third tergites aciculated.

Female. Length, 4 mm.; mostly black, antennae blackish except for the scape and pedicel, which are stramineous, flagel 41-jointed, third joint of the palpi more than half as long as the first joint of the flagel, mouth parts pale stramineous, clypeus blackish brown, facial line: transfacial line :: 12:14; tegulae stramineous, wings with a brownish tinge, stigma brownish stramineous, veins paler, nervulus received by the discoidal cell well beyond the basal vein, legs more or less pale stramineous, tarsi, hind tibiae and apical third of hind femora more or less infuscated; propodeum almost reticulated; abdomen shining, first, second and third sternites more or less stramineous, apical fourth of third tergite polished, length of the body: length of the sheaths of the ovipositor approximately :: 8:10.

Male. As long as the female, coxae almost whitish, rest of legs also paler, flagel 45-jointed, otherwise much the same as in the female.

Holotype—♀, Aweme, Manitoba, July 19, 1923, reared from a micro-lepidopteran (N. Criddle); No. 727 in the Canadian National Collection, Ottawa.

Allotype—♂, same data as the holotype.

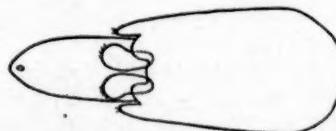
Paratype—♀, ♂, same data as the types and others with the same data except as follows: July 7, 1923, host *Pyrausta*, July 27, 1923, host tortricid.

Amblymerus lipardis n. sp.

Differs from most if not all known Nearctic species of this genus in having only two ring joints.

Female. Length 2.9 mm.; head and thorax mostly dark greenish, finely reticulated, transfacial line: facial line ::22:17, axial line: trans-facial line ::13:17, temporal line: axial line ::5.5:13, hind edge of anterior ocellus on a line with the fore edge of the hind ocelli, postocellar line: ocellocular line ::5:3, longest diameter of eyes: shortest diameter of eyes ::11:7, malar line: longest diameter of eyes ::4.5:11, antennal line a little above the lower edge of the eyes, scape slender, nearly reaching the anterior ocellus, postmarginal vein a little shorter than the stigmal vein; propodeum mostly finely reticulated like the head and thorax, median carina poorly defined, a furrow on each side nearly midway between the median carina and the spiracles; abdomen almost exactly as long as the rest of the body; scape and pedicel dark rather reddish-stramineous, nearly concolorous with the legs beyond the coxae, the latter brownish and blackish, antennae beyond the pedicel blackish, membrane of wings nearly colourless; veins smoky stramineous, abdomen dark brownish to blackish.

Male. Characters essentially as in the female. Genitalia as in the accompanying figure.



Holotype—♂, Vancouver, B.C., Sept. 22, 1921, (R. Glendenning); No. 10549, specimen and slide, No. 792 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—3 ♂, 5 ♀, same data as the holotype; 4 ♂, same data as the holotype except the date which is January 17, 1921.

Host, *Stilpnobia salicis*.

THE ALLIES OF *IPS CONFUSUS* LEC. IN WESTERN AMERICA
FAMILY IPIDAE, COLEOPTERA*

BY J. M. SWAINE,

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***Ips confusus* Lec.**

In Bulletin 14, of the Dominion Entomological Branch, the two types of *confusus* in the Leconte Collection were considered to be the same species, and the description of *confusus* given there was based largely on notes taken from Leconte's second or Arizona specimen, now in Leconte's Collection under the name *confusus*.

A study of our present larger collection of this group obtained from California, Arizona, Oregon, Washington, Montana, and British Columbia has per-

*—Contribution from the Division of Forest Insects, Entomological Branch, Department of Agric., Ottawa.

suaded me that Leconte's first and second types represent separate species, and that we have at least four and probably five species, belonging to the *confusus* group of *Ips*, from the Rocky Mountains and the Pacific Coast region of North America, represented in our collection.

Leconte's California specimen of *confusus*, now standing first in the series in the Leconte collection and the first mentioned by him in the original description, should be selected as the type.

Description of Adult.

Length, 4 to 4.5 mm.; color reddish brown to piceous black; antennal club sutures acutely angled; pubescence rather sparse and short, relatively shorter than in *vancouveri* Sw. and much less dense, hairs about the elytral declivity but little longer than the declivital teeth; punctation of the caudal half of the pronotum moderate in size, not very close on the disc, the surface between the punctures smooth and shining, the smooth median space narrowly impressed on the middle line; the elytral punctures rather small, rather sparse on the discal interspaces, becoming numerous near the declivity, the interspaces shining and but little roughened on the basal portion of the disc, granulate behind; the declivity with fine teeth, the first small, acute, placed close to the second with the bases contiguous, the second striae being widely divergent from the suture behind; the second tooth triangular, acute, incurved, much stouter and inflated basally in the male, the third tooth longer than the others, with the apex blunt, subcapitate and deflexed; the declivital cavity deep, shining, moderately not closely punctured.

The species is represented in our collection from various localities in California and Oregon, taken in *Pinus ponderosa* and *Pinus lambertiana*. The type is apparently a female, "Calif.", "1025", in the Leconte Collection in the Agassiz Museum at Harvard University.

Ips lecontei new species

The Arizona specimen, (second type) in the Leconte Collection under *confusus* Lec., should be considered a separate species. This species is of the size and form of *confusus* but differs by the usually finer and sparser interstrial punctures and the more distinctly transverse striae punctures of the basal portion of the elytral disc; but particularly by the location of the first declivital tooth which is distant from the second, the space between the 1st and 2nd being much greater than that between the 2nd and 3rd, situated as usual on the 2nd inter-space, but with the 2nd stria straight and parallel with the suture, not divergent behind as in *confusus*.

Holotype—♀, the Arizona type of *confusus* Lec. in the Leconte Collection, Agassiz Museum, Harvard University.

Paratypes—2 ♂, 2 ♀, No. 698, in the Canadian National Collection, Ottawa; 1st, Pinal Mts., Arizona, 2nd, Prescott, Arizona; 3rd and 4th, Arizona.

Ips cloudercrofti new species

Length, 3.2 mm.: A small, very slender species, piceous, with the pubescence sparse and of moderate length; the *pronotum* closely, deeply, moderately punctured behind with the median space very narrow and feebly elevated, the *elytra* with the striae impressed, the punctures moderate in size, deep, close in the striae, sparse on the discal interspaces, but hardly confused even near the declivity;

with the 1st declivital tooth distant from the 2nd, the 2nd stria being nearly straight and subparallel with the suture, much as in *lecontei*.

It differs from *grandicollis* in the closely, rather roughly punctured pronotum, with the median line faintly elevated rather than impressed, as is usual with *grandicollis*, and in the coarser sculpture of the elytra with the discal interspaces punctured throughout.

Holotype—♀, No. 699, in the Canadian National Collection, Ottawa, Cludcroft, N.M., 9,000 ft., W. Knaus.

Allotype—♂, Cludcroft, N.M., 48.

Received through the kindness of Mr. W. Knaus.

Ips vancouveri Sw.

This large and distinct species is represented in our collection from *Pinus monticola* and *Picea sitchensis* of Vancouver Island, J. M. Swaine, Coll.; Kootenay Forest, Montana, *Pinus monticola*, James Weir, Coll.; Grassy Lake, Lassen Co., Calif., *Pinus monticola*, R. Hopping, Coll.; Paradise Park, Wash., E. D. Van Dyke, Coll.; Anderson Valley, Calif., *Pinus lambertiana*.

The following change should be made in the *confusus* section, DD, of the key to the genus *Ips* in Dominion Entomological Branch Bulletin 14, page 108.

DD The discal interspaces 2, 3 and 4, punctured throughout, the punctures uniseriate towards the base, more numerous and usually strongly confused towards the declivity (uniseriate in *cludcroftii*).

E The 2nd stria on the elytral disc arcuate and divergent from the suture towards the declivity, the 1st declivital tooth close to the 2nd with the bases contiguous.

F Rather finely sculptured; the pronotum finely and rather sparsely punctured behind, the median line smooth and finely impressed; the interstrial punctures of the elytral disc much smaller than those of the striae, and sparse; the punctures of the declivital cavity sparse; the pubescence on sides of pronotum and elytra sparse and rather short, at the declivity sparse and hardly longer than the teeth; smaller, 4 mm. to 4.5 mm. long...
confusus Lec.

FF Very coarsely sculptured; the pronotum coarsely, closely punctured behind, with the median line very narrow and feebly convex; the interstrial punctures of the elytral disc nearly as coarse as those of the striae, numerous and strongly confused on the caudal half; the punctures of the declivital cavity very coarse and dense; the pubescence on sides of pronotum and elytra long and dense, that about the declivity dense, coarse, and much longer than the teeth; larger and stouter, 5 mm. to 5.7 mm. long *vancouveri* Sw.

- EE The 2nd stria on the elytral disc nearly straight, and subparallel with the suture, the 1st declivital tooth widely separated from the second.
- F A much larger, stouter species, 4 mm. long; the interstitial punctures of the elytral disc evidently confused towards the declivity, the pronotum rather sparsely punctured, the median line flat or feebly impressed. *lecontei* Sw.
- FF A small slender species, 3.2 mm. long, the interstitial punctures of the elytral disc uniserrate, hardly confused even near the declivity, the pronotum very closely, deeply punctured behind with the median space very narrow and feebly convex *cloudcrofti* Sw.

Eichhoff's *Tomicus montanus*, Borkenkafer, 1881, pp. 219-220, foot note, described from California, belongs to this group of *Ips*. It is probably a large, coarsely sculptured species, similar in appearance to *vancouveri* Sw., but distinguished from the latter by a subquadrate pronotum and the uniserrately punctured interspaces of the elytral disc. It is hardly conceivable that Eichhoff would have described the pronotum of *vancouveri* as "thorace subquadrate," and the elytra as "Reihigpunktirte Zwischenraume der Punktstreifen auf der Flugeldecken." It is probable that *I. montanus* Eichh. is a distinct species, at present apparently unknown in American collections, but to be expected in one or more of the pines native to California.

Eichhoff's description of *montanus*: "*T. montanus* n. sp. sub-elongatus, cylindricus, nigro-piceus, nitidulus, longius griseo-pubescentes, thorace subquadrate, postice crebrius punctato, elytris longioribus, profunde subcrenato-striatis, interstitiis seriatim punctatis; apice oblique, subcirculatum excavato-truncato, ambitu in singulo elytro 5-dentato, dente 3° majore capitato."

—Long. 5.5-6 mm., California.

Reihig-punktirte Zwischenraume der Punktstreifen auf den Flugeldecken, beiderseits 5-zahniger Absturz, wobei unter dem langsten dritten Zahn noch zwei Zahne stehen, charakterisieren die von Herrn Schaufuss empfangene Art."

DISTRIBUTIONAL NOTES ON CANADIAN DRAGONFLIES*

BY J. McDUNNOUGH,

Ottawa, Ont.

In spite of the cold and rainy season of 1923 a number of interesting dragonflies were obtained by my assistants in the vicinity of Ottawa and in southern Quebec. The following captures are of interest as they constitute new distributional records.

ZYGOPTERA

Lestes inaequalis Walsh. Taken sparingly at Fairy Lake, Hull, Que., (R. Ozburn) (July 11, 12). *Inaequalis* was recorded by me from the Rideau river

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

(Can. Ent., 1922, p. 255) but I know of no Quebec records for the species.

Lestes vigilax Hagen. One female was captured at Fairy Lake, Que., by Mr. R. Ozburn on Aug. 3. Also previously unrecorded from Quebec province.

Enallagma geminatum Kell. A small series of this pretty little species was collected by Mr. R. Ozburn at Fairy Lake, Que., between July 26 and Aug. 7. The capture constitutes a new record for both the Ottawa district and Quebec province.

ANISOPTERA

Cordulegaster obliquus Say. Dr. Walker records the species (1908, 49th Rep. Ent. Soc. Ont., p. 122) from Ironside, Que., a small village on the Gatineau river; a single male was taken by Mr. A. Richardson at Blackburn, Ont., which is the first record of its occurrence on the Ontario side of the Ottawa river.

Cordulegaster maculatus Selys. Several specimens were captured at Meach Brook, Que., on June 19th by Mr. A. Richardson. The species is new to the Ottawa region.

Ophiogomphus carolus Needham. One male was taken and others seen by Mr. C. H. Curran at Megantic, Que., on June 22. Apart from Williamson's note on its occurrence in the Algoma district of Ontario (Ohio Nat. 1907, 142) I know of no other records for *carolus* in Canada.'

Gomphus furcifer Hagen. One male, Fairy Lake, Hull, Que., (R. Ozburn) (July 12). One male, Leonard, Ont. Not heretofore recorded from the Ottawa region and probably unrecorded from Quebec province.

Gomphus fraternus Say. One male, Meach Lake, Que. (R. Ozburn) (July 2). New to the district.

Gomphus notatus Ramb. Mr. F. Ide captured a male of this rare species at the Mer Bleue on July 13th. This is the first Ottawa record for *notatus*; Provancher records it from Quebec under the name *fluvialis* Walsh, and Walker lists it from Lake Temiskaming, Ont. (Ent. Rec. 1914, 26) and Aweme, Man. (Can. Ent. 1912, 261). The Mer Bleue male agrees well in maculation with an Aweme female in the National Collection.

Somatochlora minor Calv. Four males were taken at Blackburn, Ont., on the north edge of the Mer Bleue by Mr. R. Ozburn on June 22. This increases the number of species of this genus occurring in the Mer Bleue to four.

Mailed April 5th, 1924

